Weather and Climate

As we told you in our last Instruction, weather and climate are not the same thing. Weather is what occurs in a specific place at a specific time. Look out the window. Weather is *what is happening out there right now*. Climate, on the other hand, is the average of what happens in a specific place over *time* (usually over a 30-year period).

In other words, *climate* is what the weather is *usually* like. If a place gets rain most of the year over many years, we naturally say it has a wet climate. If it is cold for most of the year over many years, we say it has a cold climate.

Energy transfer is involved in both weather and climate. As you know, energy is required to change any substance from one state to another -- for example, to change water from its liquid state into water vapor (and back again). So as water is evaporated from the Earth's oceans and returned as precipitation, energy (heat) is removed from the Earth's surface and set free into the atmosphere. This energy (heat) is used to power Earth's weather systems.

We learned about energy transfer and the Earth's energy budget in Earth Sciences Lesson 4, which you may wish to review now.

There are also other factors involved in weather and climate.

**Factors Affecting Weather and Climate**

The main factors that influence weather and climate include:

- variations in the Earth's orbit
- variations in the Sun's energy output
- large-scale movement of wind belts, caused by air-pressure differences in the Earth's atmosphere
- differences in air temperature between the continents and the oceans
- contours of the ground (topography)
- circulation patterns in the ocean (ocean currents)
- volcanic activity (emission of lava, ash and carbon dioxide).

We dealt with many of these factors in our preceding Earth Science Lessons. So you may wish to review Lessons 4 and 5 before taking the Practice Exercises in this Lesson or trying to solve the Problems.

For example, we explained that desert climates occur within the Earth's high pressure belts. And that what makes a desert a desert is greater evaporation than precipitation.

The continental United States is divided up into 7 major climate regions.

These regions are:
When you hear a national weather forecast on radio or television, the weather person often refers to one or more of these regions.

Here are the states that make up each region and what the climate is like there in January and July. This excellent summary is courtesy of http://weathereye.kgan.com/cadet/climate/index.html

**Climate Regions of the United States**

**Region #1 -- The Northwest**

The Northwestern region includes the states of Idaho, Montana, Oregon, Washington and Wyoming.

In January, the weather in this region is cool and wet on the coast and cooler but drier away from the coast. The higher elevations are colder, and they get a lot of snow. In July, the weather is sunny, warm and dry.

The hottest temperature ever recorded in this region was 119 degrees F. in Pendleton, Oregon, on August 10, 1898. The coldest was minus 70 degrees F. in Rogers Pass, Montana, in 1954.

**Region #2 -- The High Plains**

The High Plains region includes Kansas, Minnesota, Nebraska, North Dakota and South Dakota.

January is very cold and dry in the High Plains, but it gets a bit milder the further south you go. There isn't much precipitation because it's so dry, but whatever moisture there is falls as snow. In July, it's warm and fairly dry, although there is more precipitation than in January. The nights are cool up north and mild down south -- and it's mostly sunny throughout the region.

The hottest temperature ever recorded was 121 degrees F. in Steel, North Dakota, on July 6, 1936. The coldest was minus 70 degrees F. in Tower, Minnesota, in 1996.

**Region #3 - The Midwest / Ohio Valley**

The Midwest / Ohio Valley region includes the states of Illinois, Indiana, Iowa, Kentucky, Michigan, Missouri, Ohio and Wisconsin.

The Midwest is fairly cold and dry during January -- and the further north you go, the colder it gets. The southeastern part of the region gets the most precipitation, which comes from the Gulf
of Mexico. The Great Lakes area gets the most snow. In July, it's very warm and humid. Rain falls during July because of the hot, humid afternoons.

The hottest temperature on record was 118 degrees F. in Keokuk, Iowa, on July 20, 1934. The coldest was minus 54 degrees F. in Danbury, Wisconsin, in 1922.

Region #4 - The New England / Mid-Atlantic


January is cold in New England, although it's warmer to the south. Rain and snow come from large storm systems, which can last for a day or more at a time. A frequent storm here is the Nor'easter -- a powerful storm system that comes up from the Gulf of Mexico and dumps huge quantities of rain and snow.

In July, temperatures can be quite warm and wet. Most of the precipitation comes from thunderstorms which form from the warm, humid air.

The highest temperature ever recorded in this region was 112 degrees F. in Martinsburg, West Virginia, on July 10, 1931. The coldest was minus 52 degrees F. in Old Forge, New York, in 1979.

Region #5 - The Southeast

The Southeast region includes the states of Alabama, Georgia, Florida, North Carolina, South Carolina and Tennessee.

This region is cool and mild even in January. Skies are usually cloudy and most of the precipitation that falls is cold rain from big storm systems, including Nor'easters. Most of the snow falls north and away from the coast.

July is hot and humid, with lots of rain. This rain falls mostly in heavy downpours from thunderstorms.

The hottest recorded temperature in the Southeast was 113 degrees F. in Perryville, Tennessee, on August 9, 1930. The coldest was minus 34 degrees F. in Mt. Mitchell, NC, in 1985.

Region #6 - The South

The Southern Region includes the states of Arkansas, Louisiana, Mississippi, Oklahoma and Texas.

In January, the South has mild days and cool nights. Most of the precipitation falls in areas near the Gulf of Mexico, which provides a good source of moisture for storm systems. Areas away from the Gulf are cool and dry, and snow occurs mostly in the northern part of the South.
In July, this region is hot and humid. Rain falls in thunderstorms with heavy downpours, but it can be sunny and nice if you travel away from the Gulf.

The hottest recorded temperature in the South was 120 degrees F. in Tipton, Oklahoma, on June 27, 1994. The coldest was minus 29 degrees F. in Pond, Arkansas, in 1905.

Region #7 - The Southwest

The Southwest includes Arizona, California, Colorado, Nevada, New Mexico and Utah.

January is cool to mild, with most areas remaining dry (except along the California coast). Elevation counts, too -- the higher you go, the colder and snowier it gets.

July is warm and dry, with the hottest temperatures over the California and Arizona deserts. What little rain does fall falls mostly in the mountains during thunderstorms.

The hottest temperature on record in the Southwest was 134 degrees F. in Greenland Ranch, CA, on July 19, 1913. The coldest was minus 69 degrees F. in Peter's Sink, Utah, in 1985.